**Office of the Governor
State of Utah**

November 8, 2004

Utah Wireless Integrated Network (UWIN)
Strategic Plan

Introduction: In the aftermath of the September 11, 2001, we are reminded of the importance of reliable communications systems. Utah's Olympic experience allowed the State to acquire valuable assets to begin building an interoperable communications infrastructure for emergency communication. While the State has significant resources in place, UWIN will provide for statewide coordination, planning, and integration of these resources.

With careful planning and coordination, the State has a tremendous opportunity to leverage existing infrastructure with emerging technologies to create a model voice and data network to support a wide array of robust customer applications and needs, including voice and data interoperability.

Core Enablers: Communication and wireless technologies available today present the State with the opportunity for a significant improvement in wireless service to rural Utah, which can only be achieved with unprecedented cooperation. The purpose of this plan is to bring about that cooperation through coordination of network and wireless services. The elements of that cooperation are contained in what has been designated as core enablers. These enablers include:

Planning, Policy, and Funding
Strategic planning, policy, and funding are the foundation of all communication and wireless planning activity. The plan provides the overall direction and vision of the network and has defined the goals and objectives necessary to accomplish those strategic directions. The planning process includes a careful review, assuring that goals are met, activities coordinated, and obstacles resolved. The policies to be developed or refined include connectivity and resource sharing agreements, security, and network operations and monitoring. The goals for planning, policy, and funding are included in more detail in the full body of the strategic plan.

Network Infrastructure and Services
The network infrastructure and services include the physical facilities, circuits, switches, routers, servers, staff, and technical services needed by network users, especially agencies that provide critical public safety and health services throughout the State. The priority for network infrastructure is access, capacity, circuit speed, reliability and redundancy, security, and service level agreements that ensure that agencies receive adequate services. This plan proposes to leverage the State Wide Area Network (WAN) as the primary vehicle for enabling integrated wireless services to rural Utah in cooperation with ITS, Public Safety, Corrections, UCAN, and other network service providers, such as UEN and the Courts, as practicable. Services stressed in this plan emphasize wireless data and voice communication throughout the State.

Current Situation: Historically, agencies throughout the state of Utah have been responsible for providing communication for the assets for which they are accountable. In addition, the State

operated a statewide channel that provided communications for agencies when traveling beyond the range of their home coverage. The radio spectrum utilized for this system was located in the 150 MHz (VHF) and 450 MHz (UHF) spectrum. UCAN provides 800 MHz coverage in their primary Wasatch Front coverage area. Mobile data services are available principally on the Wasatch Front and along the I-15 corridor, using one of several private vendor products.

Several years ago the FCC announced that it intended to restrict and re-license all spectrums below 512 MHz. This came at a time when the agencies along the Wasatch front were looking to upgrade aging systems and create interoperable communications between State and local public safety agencies. In 1997 the Utah State Legislature created the Utah Communication Agency Network (UCAN) organization that collectively analyzed the problem and engineered a solution for the voice communication problem. Utilizing a number of grants and debt service, UCAN installed and now operates an 800 MHz trunking system covering much of the Wasatch front. UCAN currently uses rates for system utilization to cover debt service payments and maintenance for the system. UCAN operates and maintains a 10-county system, covering one-third of the state, serving 101 public safety agencies, connecting 44 remote sites and towers, and 17 Enhanced 911 centers, and it serves over 10,000 radio users. The 800 MHz trunked network operated by UCAN has not been able to expand much beyond the eight counties around the Wasatch Front. This has been due to prohibitive costs associated with expanding the architecture on a statewide basis.

The principle State agency users of wireless infrastructure include the Utah Department of Public Safety, Utah Department of Administrative Services, Utah Department of Transportation, Utah Department of Natural Resources, Utah State Tax Commission, Utah Department of Health, Utah Communication Agency Network (UCAN), Utah Department of Corrections. Local law enforcement and emergency response agencies, and Federal partners are also key participants.

Most public safety agencies within the Wasatch Front are now using the UCAN 800 MHz trunked network. Agencies outside of the Wasatch Front typically use VHF conventional (non-trunked) technologies. Most State agencies within the UCAN coverage area use two radios so they can communicate with agencies when they travel outside the UCAN coverage area. The UCAN coverage area is illustrated in Figure 1.

ITS currently maintains two statewide VHF conventional wireless voice products. The Department of Public Safety finances the Law Enforcement System (LES), while the State Repeater System (SRS) is fully owned by ITS, receiving user fees of $3.97 per month from agencies that utilize the system. This is illustrated in Figure 2. While the coverage is fairly broad, interoperability is limited and data is not supported.

Law Enforcement System (LES): The LES consists of 74 base stations, 14 control stations, 50 microwave circuits, as well as various costs for maintenance and cost recovery of dispatch center consoles. Law enforcement agencies participating in each of the six State-managed dispatch centers (Box Elder, Salt Lake TOC, Richfield, Cedar City, Price, and Vernal) typically rely on the LES radio network for their VHF needs. The current annual cost to maintain the LES network is $242,700.This cost and others are funded by the State legislature to DPS, who in turn pays ITS per established rates. Since the LES system is financed by DPS, other law-enforcement agencies currently pay no user fees for the use of the network. There is little incentive for a rural law enforcement agency to move from a system that costs them nothing more than a one-time purchase of the radio in the car (typically $300 to $1,300) compared to the UCAN network, which currently costs $22.50 per month per unit for non-State agencies, $30 for State, and the radios themselves typically run $2,500 to $3,500 each.

State Repeater System (SRS): The SRS consists of 35 base stations, 13 Control Stations, 51 microwave circuits, as well as various costs for maintenance and cost recovery of dispatch center and UDOT consoles. The SRS is used primarily by DOT, DPS and DNR. There are currently 3,738 users paying a monthly user fee of $3.97 per month to ITS for a total annual revenue of

$178, 078.32. Although available to non-State agencies, the SRS is seldom used by these agencies, and no revenue is received from them. No technology is readily available to track actual users or airtime on the system.
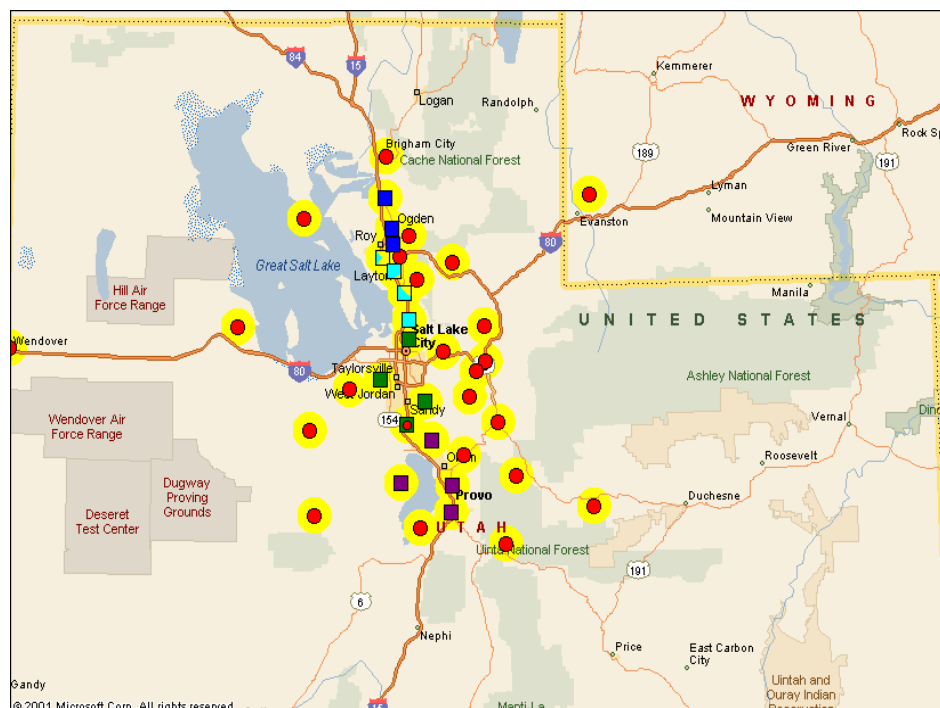
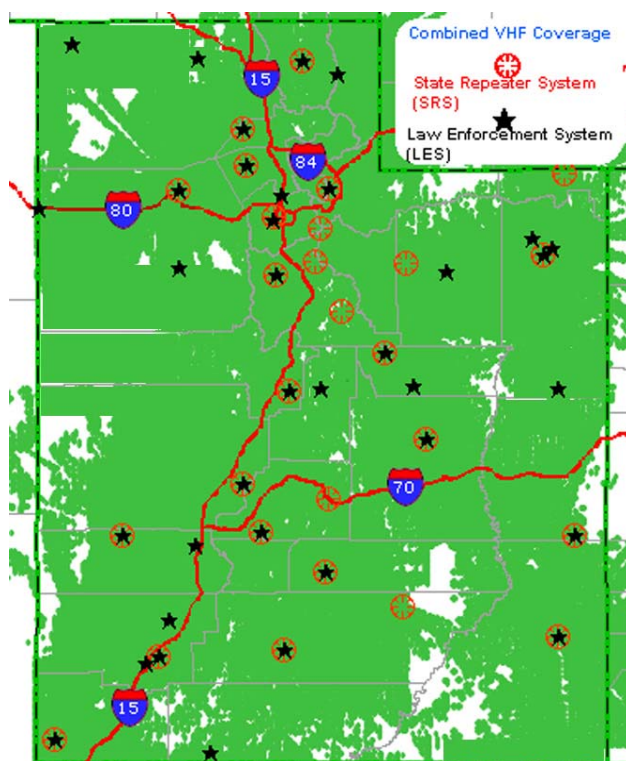

Figure 1: UCAN Coverage Area (800 MHz Voice)

Figure 2: SRS and LES Voice Coverage at 150 MHz

Interoperability: Last year, DPS utilized part of the State's portion of Homeland Defense funding to purchase new zone controllers and the Omni-Link™ interoperability solution from Motorola. These replaced UCAN's aged zone controllers and operating system. In an effort to increase interoperability, Salt Lake City purchased the same version of zone controller and Omni-Link to ensure that a seamless radio network would be the result. Figure 3 illustrates the overall concept of Omni-Link™.

This effort allows that any dispatch center in the state, with the proper hardware and software, can utilize any trunking talk group or conventional VHF asset of any other dispatch console similarly connected.

Example One: The Richfield Dispatch Center must be evacuated. Their 911 calls are re-routed to the Cedar City dispatch center. The Cedar City dispatch center can control all of the radio assets of the Richfield center.

Example Two:
A UHP hazardous materials officer in Price urgently needs to communicate with a bio-toxin expert in Salt Lake. The dispatcher in Price can select a Salt Lake UCAN talk-group and patch it to the officer's channel in Price.

Example Three:
The Commissioner of Public Safety is in St. George. An emergency situation has developed in Salt Lake City and the Governor, located in the DES emergency coordination center, needs to talk to the Commissioner. The DES console operator can set up a patch to any channel in the St. George city console.
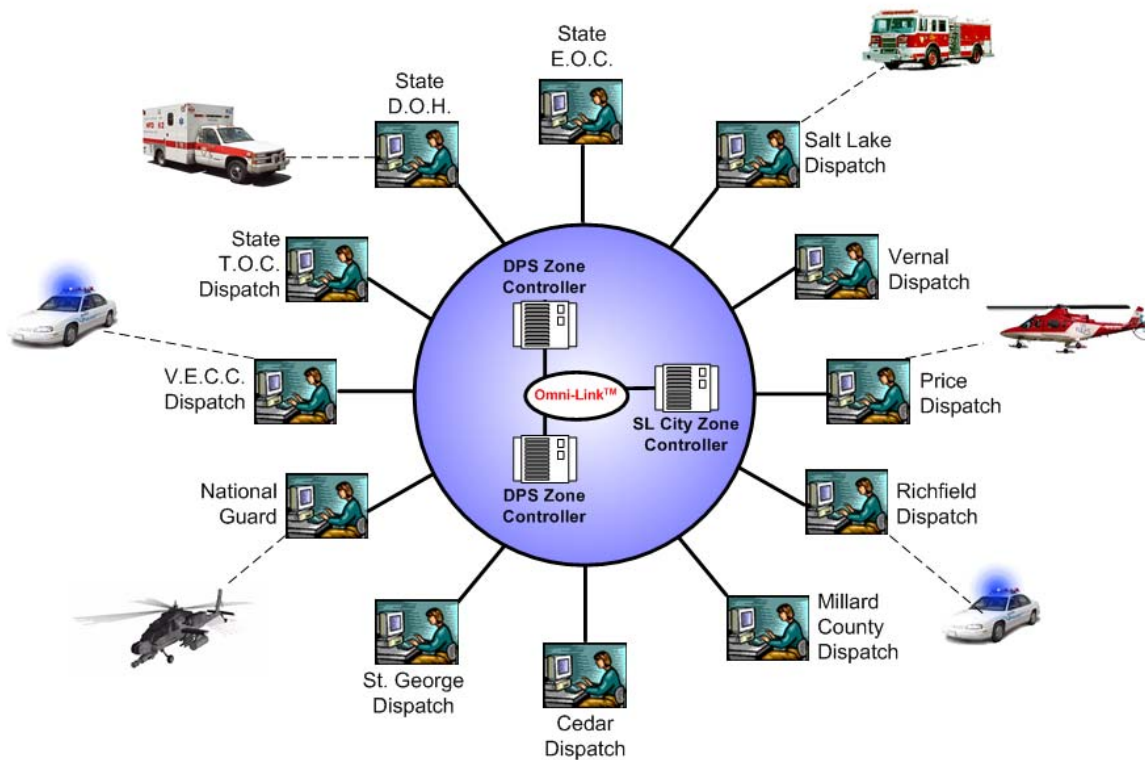

Figure 3: Omni-Link™ Statewide Interoperability Model

802.11b Wireless: 802.11b 'hot spots' have been established at various buildings throughout the state to facilitate wireless connection to the State WAN. Additional network connections and hot spots for wireless are planned for most of the UDOT road sheds in rural areas throughout the State. Any user with WAN access privileges will be able to access the network using these facilities.

Security Implementation: ITS has completed testing on the Odyssey client product. This product and others are being reviewed by the UWIN Technology Steering Committee. Tim Cornia, Deputy IT Director for DPS, leads the UWIN Wireless Ethernet project team.

Mobile Data: AT&T's Cellular Digital Packet Data (CDPD) has been the choice for law enforcement agencies in the Wasatch Front for the last decade. At a cost of $50 per month with unlimited use, the 19.2 Kbps CDPD was a good deal for public safety. With CDPD technology due to expire in mid 2005, new and technologies emerged from each of the larger cellular phone service providers. Various digital wireless vendors are offering speeds of around 100K for approximately $70 per month—and competition is still dropping costs. The relatively new 802.11 wireless data technology is up to one thousand times faster than CDPD, and can be delivered at a fraction of the cost—typically $200 per card with no user fees unless purchasing services from a vendor. The inherent limitations with 802.11 are that it is short-range transmission; typically 300 yards (though several miles are possible in optimal circumstances).To build a seamless statewide 802.11 network, significant additional facility infrastructure and hardware would be needed. There is also an inherent security risk with this type of solution. The frequencies that 802.11 are operating on are unlicensed, which means that anyone can use them. This already causes a huge interference problem, as more users install their own 802.11 hot spots. (See Figure 4.)
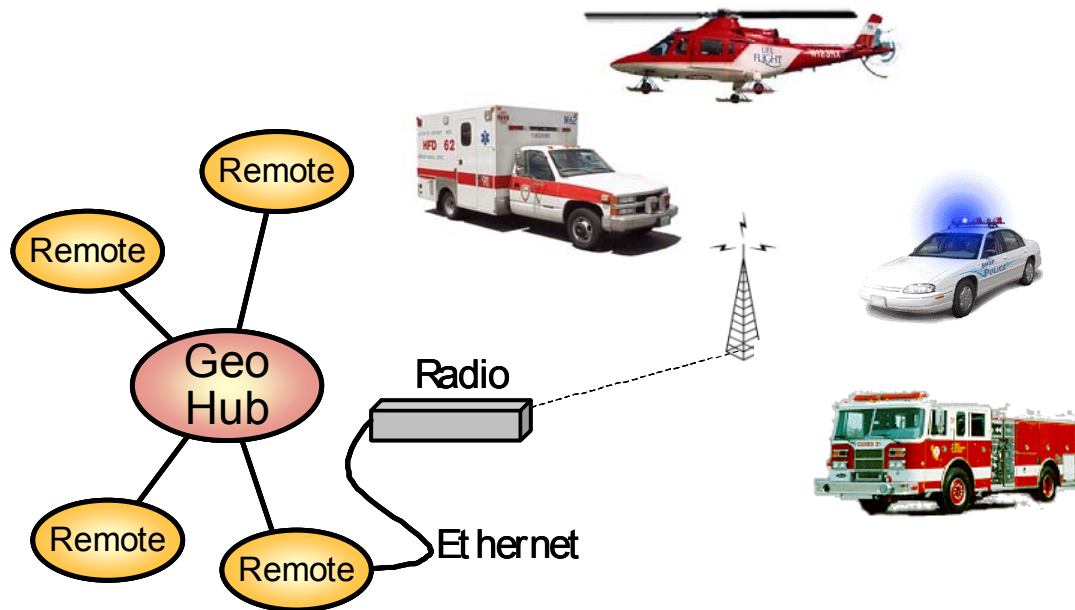

Figure 4:700 MHz Mobile Data Geographic Connectivity

Wireless data services provided by the major carriers run on the same network which services cellular voice customers. This has led to service issues during key times of the day. These same times are often most critical to public safety users.`

The problem with all of these mobile data services is that they do not address the needs of rural Utah. ITS, after receiving unanimous approval from the UWIN Governance Board, is currently implementing a statewide mobile data solution by IPMobileNet. Each of the mobile data technologies typically use transmit power levels of less than 1/2 watt. IPMobileNet units, using licensed public safety 700 MHz channels, can transmit between 40 to 200 watts from mountaintop locations statewide. Using the State's allocated 700 MHz spectrum will mitigate interference problems inherent to the 802.11 systems. This new 700 MHz mobile data solution is the first statewide deployment in the nation.

The IPMobileNet vehicular devices cost $1,800 each, The original roll-out will provide speeds of up to 33K.Upgrades for 64K and 128K can be purchased in advance for $250 each (consecutively).A monthly user fee of $15 per month per device has been approved via the State rate committee. Additionally, a lease rate of $53 is available for agencies who are already used to paying the rates for the public data systems, but cannot afford the one-time cost of the IPMobileNet modems. (See Figure 5.)
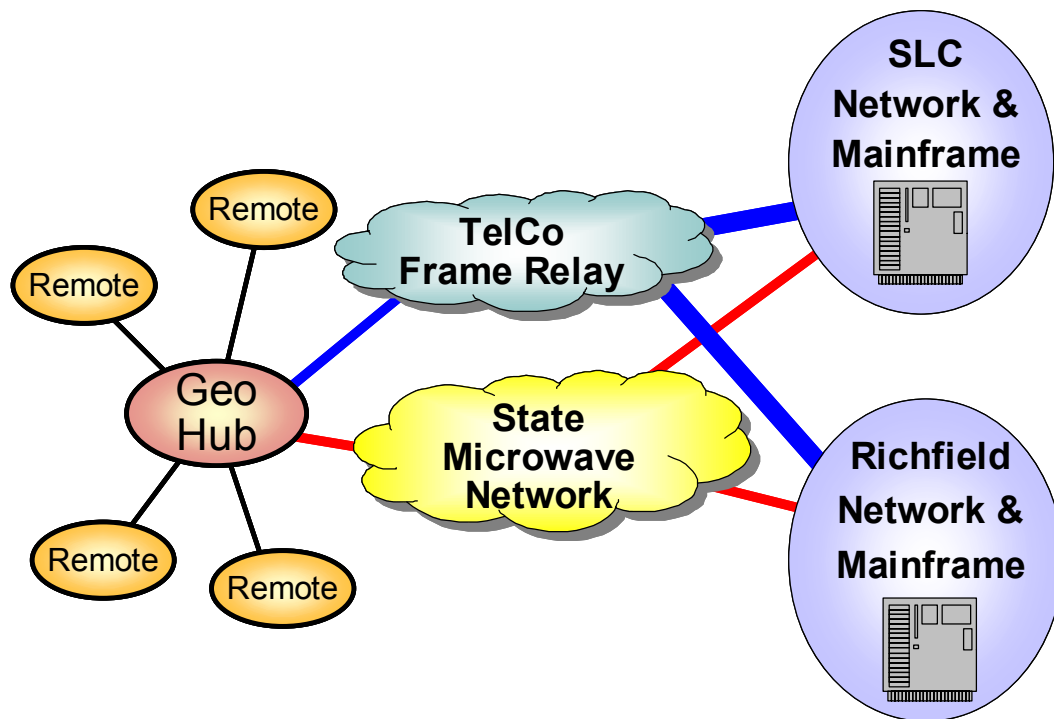
Figure 5: Mobile Data Geographic Hub Redundant Infrastructure

Probably the greatest cost-savings will be associated with overlaying this new mobile data network over the existing State Wide Area Network (WAN). This solution will provide a seamless statewide wireless WAN. The cost to build such a system is relatively small in comparison to other solutions because it leverages the use of the existing ITS digital radio network. Figure 6 illustrates the coverage area of the current ITS Microwave network with T1 lines to WAN geographic hubs across the state.

Figure 6: ITS State Network Coverage Data and (Voice)
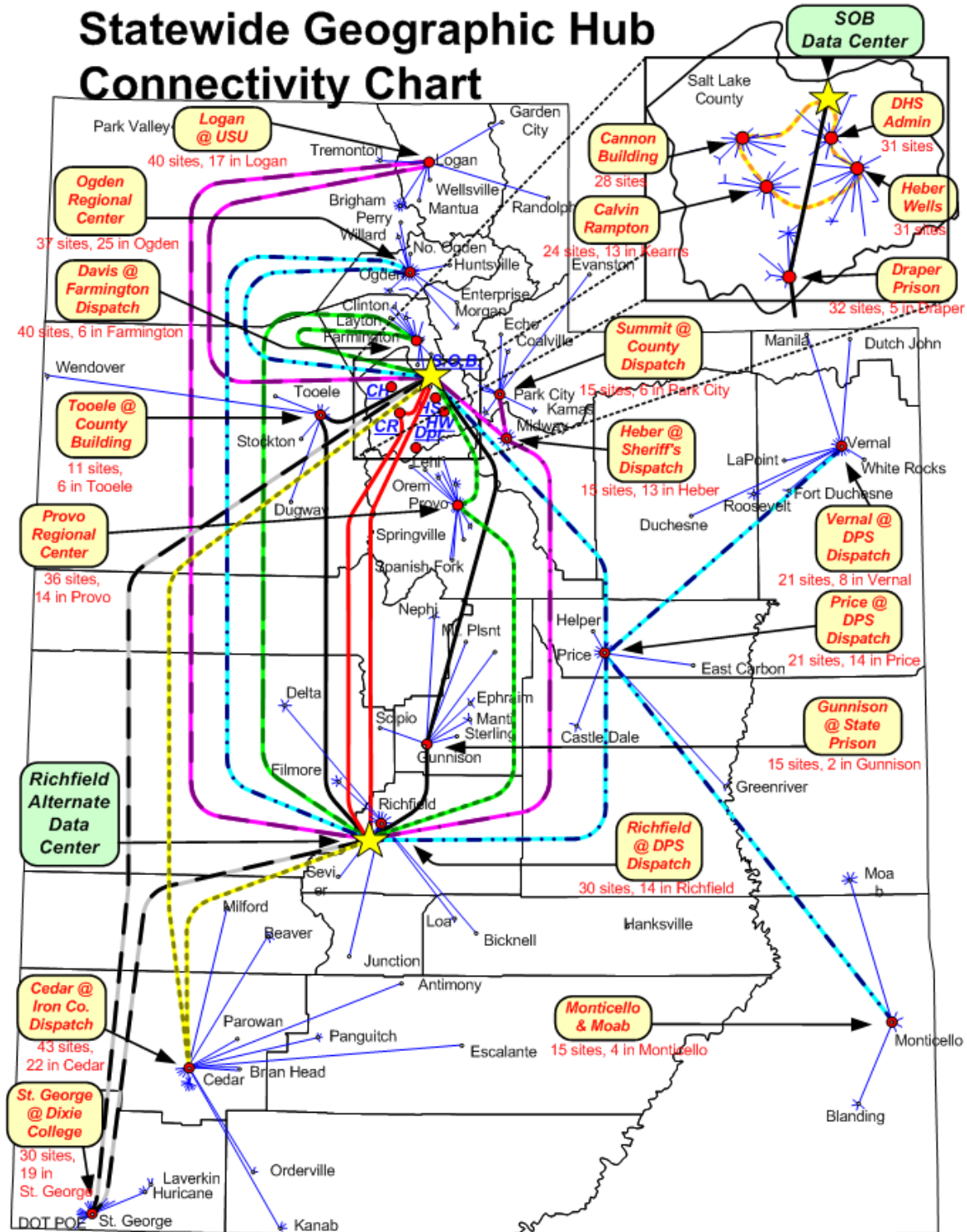
Customer Needs Alignment: Basic customer needs can be summarized into five areas including shared systems development; coordination and partnerships; funding; spectrum; standards and technology; and security, as illustrated in Figure 7, which is a representation of where the State is in each of these areas based on a recent Public Safety Wireless Network (PSWN) assessment of Utah. The table has been modified slightly to more accurately reflect an assessment on some of the key items.
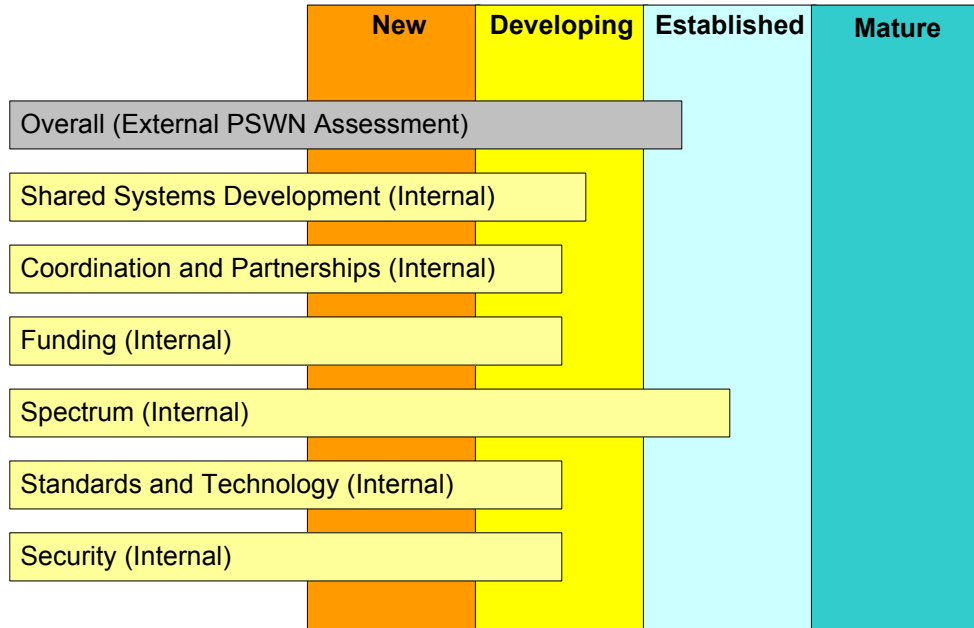
	New	Developing	Established	Mature
Overall (External PSWN Assessment)				
Shared Systems Development (Internal)				
Coordination and Partnerships (Internal)				
Funding (Internal)				
Spectrum (Internal)				
Standards and Technology (Internal)				
Security (Internal)				

Figure 7: Customer Needs Capability Assessment

Shared Systems Development: Public Safety agencies at all levels of government should share existing infrastructure, i.e., buildings, paths, monitoring, et cetera, to enhance interoperability, reduce costs, and eliminate interference problems.

Coordination and Partnerships: Public safety agencies from all levels of government with similar missions and goals should coordinate, collaborate, and pool their resources to develop systems that will lead to improved interoperability. This effort involves statewide and regional planning that will enable the State and local governments to reduce costs, improve spectral efficiency, and resolve architectural, technical, and organizational problems that create barriers to interoperability. Local, State, Federal, and tribal agencies should participate in collaborative activities, such as established forums, where they can share information, experiences, and lessons learned in solving interoperability problems. Government decision makers can also work with agencies to provide leadership and make policy changes where necessary. The outcome of each of these efforts will be cooperation that breaks down barriers and increases interoperability.

Funding: Identified as one of the bigger obstacles to interoperability, funding for the development of new public safety radio systems, or the replacement of existing systems, is difficult to obtain. Public safety agencies have no means of generating revenue and, as a result, must rely on Federal grants, government officials, and the legislature to fund radio system replacements. Too often, decision makers do not have sufficient information to garner support for such a large expenditure. Public safety officials must provide these decision makers with adequate information and emphasize the mission-critical importance of efficient communications. In many cases, a strategic plan is necessary to clearly identify the problem and could be the difference between receiving funding and waiting for the next budget cycle. The public safety community must ensure

that this obstacle to interoperability is addressed so it can carry out its mission as effectively and efficiently as possible.

Spectrum: The amount of spectrum currently available to public safety agencies is divided between several frequency bands: VHF, UHF, 700 MHz, and 800 MHz. Currently the 800 MHz public safety frequency band is split between private vendors and government users. A variety of users are employing spectrum for a range of different applications, from voice communications to more advanced technologies such as high-speed data, imagery, and video transmissions. The Federal Communications Commission has recently allocated additional spectrum in the 700 MHz band for public safety use and granted Federal agencies co-equal access to new spectrum. Equally important, the Nation's leaders must make a concerted effort to promote spectral efficiency and protect public safety agencies from interference to provide robust, reliable communications services.

Standards and Technology: Interoperability of public safety wireless communications systems is an issue that can potentially affect the entire Nation. Although vendors are offering new systems and technologies to the public safety community, many of these are proprietary in nature, forcing consumers to pay higher prices due to the lack of a competitive process, and do not allow interoperation with equipment from other manufacturers. Whether the problem is incompatible radio spectrum or incompatible technologies, the public safety community must drive the development of, and adherence to, standards governing these new technologies. The public safety community must become more involved in the standards development process to ensure that it is not driven by a few manufacturers, but by the users of the equipment who know best how it has to function. By helping develop standards for equipment in the public safety arena, then requiring manufacturers to adhere to those standards, the goal of communications interoperability may be easier to reach.

Security: Advanced technology and increased interoperability have provided significant benefits to the public safety communications community. However, as systems strive to become more interoperable, it has become clear that potential new security risks will have to be addressed. As more users access different systems, public safety agencies must take steps to protect their systems and the information they carry. The key components of secure communications are secure facilities and networks, reliable backup systems, secure transmissions, and constant vigilance. Agencies must address systems security throughout the entire system life-cycle process and make it part of ongoing systems operations. The *Public Safety Communication Awareness Guide* has suggested that the following security components be addressed for wireless networks carrying public safety information:

- **Physical Security:** Physical security includes the protection of all facilities where communications system components are housed. This may include the communications center, remote tower sites, and maintenance facilities, as well as the communications equipment itself. Equipment must be secured at all times, including while it is in use, while it is being transported for maintenance purposes, and while it is in the maintenance cycle.

- **Network Security:** Network security involves the protection of the systems hardware, software, and associated interfaces. Common network security requirements include maintaining user accounts, controlling passwords and system access, performing routine system audits, and removing unnecessary sensitive information from the system.

- **Communications Security:** Communications security relates to those measures taken to ensure the confidentiality and integrity of information transmitted over the airwaves. This includes the use of encryption, the management and reprogramming of encryption keys, and the safeguarding of key codes and software.

- **Administrative Security:** Administrative security involves the use of procedural controls to ensure the confidentiality, integrity, and availability of communications systems. An

administrative security program would include security plans, procedures, documentation, security awareness training, and personnel security.

Strategic Vision and Mission

Vision: UWIN is a wireless intergovernmental network that will leverage existing State resources. The network will provide seamless, coordinated, and integrated communication for local, State, and Federal agencies. This will allow public safety agencies the flexibility to communicate on a wide variety of vendor products statewide.

Mission: To plan for and foster coordination and integration among wireless networks on a statewide basis that meet the requirements of local, State, and Federal public safety and other State agency needs. This will be accomplished by:

- Coordinating existing wireless resources controlled by UCAN, ITS, UDOT, UEN, DPS and other Federal and local agencies to avoid duplication and to provide services that are reliable, efficient, and cost effective.

- Addressing the six key interoperability issues of shared system development: coordination and partnerships, funding, spectrum, standards and technology, and security.

- Listening to, learning from, and collaborating with local and State public safety officials and other key agency users to improve communications interoperability.

- Encourage the implementation of statewide wireless systems development efforts and work in cooperation with key Federal agency efforts.

In order to achieve this vision and purpose, the participating agencies of UWIN envision the achievement of the following strategic goals:

Goal 1: Central coordination for establishing and ensuring interoperable communications.

Goal 2: Statewide design and implementation plan development for interoperability and availability of wireless services.

Goal 3: Maximize the effectiveness of interoperability efforts on a statewide basis.

Goal 4: Strengthen the State's communication infrastructure to include hardware, software, and personnel to enable rapid restoration of essential public health and safety services in the event of a disruption.

Goal 5: Business plan development to ensure the financial viability of statewide wireless services.

Strategic Goals, Objectives, Strategies, and Measurements: Central coordination and collaboration for establishing and ensuring interoperable communications.

> ***Objective 1:*** *Coordinate the efforts of key State, Federal, and local organizations that impact wireless communication.*
>
> - **Strategies:**
>   1. Establish a governance group to coordinate wireless development comprised of key State, Federal, and local agencies and providers.

2. Provide assistance teams to State and local agencies to aid in overcoming specific technical or policy obstacles impeding regional or statewide interoperability.
3. Work closely with key State and local agency leaders to develop solutions and frameworks that build agreements for interoperable systems.
4. Identify and collaborate with core working groups from each State and local agency who influences wireless and agency business requirements, and help establish wireless interoperability input to the UWIN governance group.
5. Foster relationships among various Federal agencies to reduce redundancy and facilitate collaboration with State and local agencies.

- **Outcomes and Performance Measures:**
  1. Assure that a governance group is functioning that meets regularly and coordinates the development of wireless products and infrastructure for user agencies.
  2. Complete interoperability projects in all areas of the State by 2005.
  3. Achieve a statewide level of interoperability for all participating agencies.
  4. Assure that shared, statewide systems are being pursued in all areas of the State where the local agencies have agreed to participate in wireless interoperability projects.
  5. Achieve 99 percent satisfaction from agencies assisted by UWIN regarding the quality and suitability of the wireless services provided.

Objective 2: Collect data to assess the interoperability of wireless communication as it relates to the six key issue areas of shared system development, coordination and partnerships, funding, spectrum, standards and technology, and security.

- **Proposed Strategies:**
  1. Complete a benchmark for each provider of the six interoperability areas for each of the wireless service offerings available to agencies.

- **Outcomes and Performance Measures:**
  1. A published benchmark document is available that assesses the current state of interoperability for State wireless service products.

Objective 3: Initiate coordinated test projects to refine interoperability solutions and make services available on a statewide basis.

- **Strategies:**
  1. Key implementation agencies such as ITS, UCAN, UEN, Corrections, and Public Safety should identify needed pilot projects that will enhance wireless access and interoperability.
  2. Outcomes of pilot projects will be used as a basis for enhancing existing wireless products and developing new wireless services.
  3. Implement gateways and related technologies that facilitate communication between diverse wireless spectrum implementations.
  4. Assemble an engineering team to build a wireless interoperable network solution.

- **Outcomes and Performance Measures:**
  1. Pilot wireless projects receive authorization and prioritization from the Wireless Governance Group as part of an established review process.
  2. Pilot project results are made available to all participating members of the wireless governance group.
  3. A tested wireless solution has been implemented.

Goal 2. Statewide design and implementation plan development for interoperability and availability of wireless services.

Objective 1: Compile existing findings and best practices identified through studies, evaluations, and pilot projects to provide an information base for implementation planning.

▪ **Strategies:**
1. Develop a short-term implementation plan with DPS, UDOT, DNR, UEN, Corrections, ITS, and UCAN planners and technicians with a defined timeline and deliverables.
2. Conduct necessary pilot projects to validate interoperability, performance, and availability.

▪ **Outcomes and Performance Measures:**
1. An overall implementation plan has been completed, reviewed by stakeholders, and has funding and personnel resources assigned.
2. All key pilot and feasibility projects have been completed prior to final implementation.

Objective 2: Document the agreed upon architecture required to support statewide wireless services and all associated infrastructure.

▪ **Strategies:**
1. Establish a wireless architecture team to develop the Conceptual Design documents and recommended standards for the network.

▪ **Outcomes and Performance Measures:**
1. A conceptual architecture design document details the direction and future development of the statewide wireless network.
2. Migrations from older to newer technologies are documented with recommended timelines.

Objective 3: Develop an implementation plan that integrates existing solutions and products with management and policy processes to develop statewide interoperability.

▪ **Strategies:**
1. Develop an implementation plan that integrates existing wireless services into a single coordinated service network.
2. Identify needed management policies and processes to support statewide implementation.

▪ **Outcomes and Performance Measures:**
1. An implementation plan with targets, timelines, and resource allocation has been completed and is available to participating agencies.
2. Documentation has been completed for key implementation processes.
3. Statewide policies to support wireless implementation are available and have been approved by the governance group.

Objective 4: Promote and communicate statewide solutions, standards, and technologies to public safety and other agency wireless users.

▪ **Strategies:**
1. Develop standards, operational, and communication materials that clearly explain and promote State wireless solutions.

- **Outcomes and Performance Measures:**
  1. A conceptual architecture design document detailing the direction and development of the statewide wireless network.
  2. Operational documentation is available for agencies that wish to use wireless services.
  3. Communication and marketing materials are available that explain the wireless network and its features and benefits to agencies.

Goal 3: Maximize the effectiveness of interoperability efforts on a statewide basis.

Objective 1: Develop a statewide information center that promotes wireless interoperability and fosters the adoption of systems that are consistent with established principles and best practices.

- **Strategies:**
  1. Create a Technology Clearing House Committee that would be a resource to user agencies by ensuring interoperability standards are met by vendors who can receive committee endorsements.

- **Outcomes and Performance Measures:**
  1. Agencies can receive information and training on available interoperability compatible technologies.

Objective 2: Provide teams to agencies who help with local implementation of wireless systems consistent with established State practices.

- **Strategies:**
  1. Create an Engineering Committee that can assist agencies in the identification and assessment of their wireless communication needs.

- **Outcomes and Performance Measures:**
  1. Agencies can receive presentations and demos of equipment and technologies that are available and endorsed by UWIN.

Objective 3: Collaborate with regional groups within Utah to provide systems that are geographically tailored to improve and encourage regional and inter-regional operability.

- **Strategies:**
  1. Utilize 911 Public Safety Access Points (PSAPs) throughout the state to collect and disperse information related to the efforts of the UWIN organization.
  2. Create and update a Web site dedicated to the concept and goals of UWIN.

- **Outcomes and Performance Measures:**
  1. In addition to direct contact with UWIN agencies, public safety entities will be able to look no further than their associated PSAP for the latest information on wireless communications interoperability.

Objective 4: Monitor changes in the regulatory, fiscal, and technical environment to ensure the continued development of interoperability solutions.

- **Strategies:**
  1. Agencies providing telecommunication infrastructures have highly trained and knowledgeable technical personnel. The interactions with a centralized governance group will ensure that these technicians keep UWIN associates current on issues related to industry needs and standards.

2. Form a narrowband migration project team within the UWIN Technology Steering Committee, to ensure that all agencies understand the upcoming changes to their VHF and UHF spectrum.

▪ **Outcomes and Performance Measures:**
1. FCC Licenses are kept current.
2. Cost recovery will drive, as well as balance, the proper level of resources used to respond to public safety wireless needs.
3. A narrow band migration plan will be presented to the Governance Board by the Technology Steering Committee.

Goal 4: Strengthen the State's communication infrastructure to include hardware, software, and personnel to enable rapid restoration of essential public health and safety services in the event of a disruption.

Objective 1: Evaluate and strengthen measures for protecting the State's communication infrastructure.

▪ **Strategies:**
1. Use existing State committees, boards, and task forces to develop best practices.
2. Complete a threat assessment and risk assessment mitigation study for the State's wireless infrastructure.
3. Identify priority areas for infrastructure development investments that will help ensure reliability, availability, and serviceability (RAS).

▪ **Outcomes and Performance Measures:**
1. A bid is awarded to a vendor for an outside point-of-view engineering threat assessment.
2. A redundant system is monitored 24x7 with a fully trained staff to sustain the supported UWIN technologies.
3. Reliability standards are agreed upon for the delivery of telecommunications services:
   a. Public Safety Microwave
   b. Non-Public Safety Microwave
   c. Public Safety Conventional Radio
   d. Public Safety Trunked Radio
   e. Non-Public Safety Conventional and Trunked Radio

Objective 2: Facilitate rapid restoration of the statewide communication infrastructure after disruption by natural or man made disasters in cooperation with the State, Federal, and private sectors.

▪ **Strategies:**
1. Identify opportunities for mandatory redundancy and fail over.
2. Increase agency awareness of emergency remediation procedures.
3. Establish priorities for spectrum use with State, Federal, and local agencies in the event of disruption.
4. Monitor statewide systems for failure or degraded service.
5. Provide effective backups for critical infrastructure components.

▪ **Outcomes and Performance Measures:**
1. A completed and tested disaster recovery (DR) plan is in place.
2. Develop a business recovery (BR) plan that allows Public Safety communications to operate independently of any State WAN service interruption.

3. Utilization of the ITS Network Control Center (NCC) is increased for Harris Starscan and Badger alarm monitoring.
4. User Agreements are established for the use of the ITS NCC for 24/7/365 response to problems and outages.

Objective 3: Develop policies and procedures that promote access to effective communication in emergency situations.

▪ **Strategies:**
1. Establish appropriately balanced policies for wireless priority access in emergency situations.
2. Cooperate with industry to resolve interoperability constraints.
3. Work with the FCC to enforce interference and public safety regulations.
4. Facilitate the development of E911 technologies and host a Wireless 911 Web page within the UWIN Web site.

▪ **Outcomes and Performance Measures:**
1. UWIN agencies will ensure that FCC licenses are properly posted with all transmitters
2. Where possible, UWIN will develop and enhance communications site user group policies.
3. Cell phone service providers will provide PSAPs time lines for compliance with E911 Phase Two compliance for location coordinates.

Goal 5: Business plan development to ensure the financial viability of statewide wireless services.

Objective 1: Analyze costs associated with maintenance, bonding, and reinvestment for an interoperable wireless system that meets agency requirements.

▪ **Strategies:**
1. Develop a financial plan that addresses revenue, operational budgets, and capital investment requirements for a sound statewide wireless infrastructure and related service products.

▪ **Outcomes and Performance Measures:**
1. An annual business planning process has been implemented with appropriate attention to all cost and revenue requirements.

Objective 2: Develop an overall capital investment strategy.

▪ **Strategies:**
1. Develop an investment strategy that utilizes diverse funding patterns including bonding, appropriation, and fee-based revenues.

▪ **Outcomes and Performance Measures:**
1. An investment strategy has been approved that addresses the short term and long-term needs of UWIN.

Objective 3: Identify key opportunities for resource sharing that minimizes cost and increases efficiency and effectiveness.

▪ **Strategies:**
1. Implement a governance structure charged with resource sharing, and quality service delivery.

2. Establish a customer advisory board to identify emerging requirements and service quality. Include customers and key Federal and local partners.
3. The advisory board has clearly defined controls and roles for participation

- **Outcomes and Performance Measures:**
    1. A UWIN governance structure is in place and operating according to pre-defined missions and goals.

A UWIN customer advisory board meets at least six times per year as an advisory body to UWIN.

Objective 4: Identify the key products that will be provided by a statewide wireless service organization with appropriate assessments of revenues and possible rates.

- **Strategies:**
    1. Develop product definitions and business cases for all UWIN products.
    2. Recommend and establish cost recovery rates for all products.

- **Outcomes and Performance Measures:**
    1. Product definitions for UWIN products have been developed and are in a regular product management review cycle.
    2. The State Rate Committee has approved rates for all UWIN products.
    3. No products are offered to customer agencies without first obtaining the approval of the UWIN governance structure

Opportunity: Implementation of this plan will provide the following benefits to the State:

- Statewide voice interoperability.
- Statewide data interoperability.
- The ability to leverage and integrate existing assets to provide interoperability between rural and urban Utah.
- The ability to leverage vendor pricing and support of the public safety telecommunications infrastructure.
- Increased accuracy of reports and data sharing.
- Improved coordination of multi-jurisdictional response.
- Decreased duplication of services.
- A common medium that all public safety entities can access regardless of vendor product.
- Lower vendor pricing due to competition overcoming proprietary products offered by vendors.
- Real time information to improve resource allocation.
- Improved response to natural and man-made disasters (hurricanes, floods, aircraft crashes, structural collapses, etc.).
- Direct communications between mobile units of multiple agencies.
- Better information to make critical decisions involving the safety of the public.
- Enhanced safety for public safety personnel and the public in general.
- On-scene access to local and national databases providing critical information on hazardous materials and other related information.
- A choice for agencies in what product they use for two-way communications.
- The opportunity to lead the nation in the development of a practical and cost effective integrated wireless network.

Assumptions: Fundamental to this plan are the following assumptions:

- All impacted agencies will be included and involved.
- The governance organization will be inclusive of all jurisdictions.
- Specific short term and long term planning goals will be clearly identified.
- Future needs of all participating agencies, as well as potential participants, will be assessed.
- Key government leaders will provide support.
- Existing open standards will be used as much as possible.
- Small rural agencies will receive services at little or no cost.
- Law enforcement agencies will buy in and support service products on a consistent basis across the State.
- Challenges to information sharing and cooperation can be dealt with and appropriately mitigated. These include:

  - Individual resistance to changes and cooperative resource sharing.
  - Institutional barriers such as separation of powers and jurisdictions; Federal, State, and local relationship issues; and, political factors, especially dealing with issues of power and control.
  - Systemic constraints such as variety and complexity of existing systems; varying technological capabilities from agency to agency; fragmented infrastructure approaches; and, lack of adequate technical personnel in agencies.

- Resources will be shared whenever practicable.
- Technology decisions will be optimized in favor of time to benefit for agencies, not just the implementation of the newest technologies.
- Integration of voice and data services will be a primary technology and business driver.
- The State WAN will become the backbone for extending service into rural Utah.
- ITS will continue with the installation of 802.11x hot spots at designated locations throughout the State.
- Issues with initial capital investment requirements and ongoing funding requirements can be resolved favorably with agency support.
- UWIN agencies have the technical expertise to design and implement this plan.

End State or Outcome: The diagram in Figure 8 illustrates a combined IP network that will support wired and wireless communication on a statewide basis, integrating technologies and resources from UCAN, LES, SRS, and the State WAN. This approach pushes all communication over an IP backbone with A-D and D-A converters for other non-IP radio technologies, especially those in rural Utah, and gateway servers to facilitate interoperability requirements.

Combined State Network

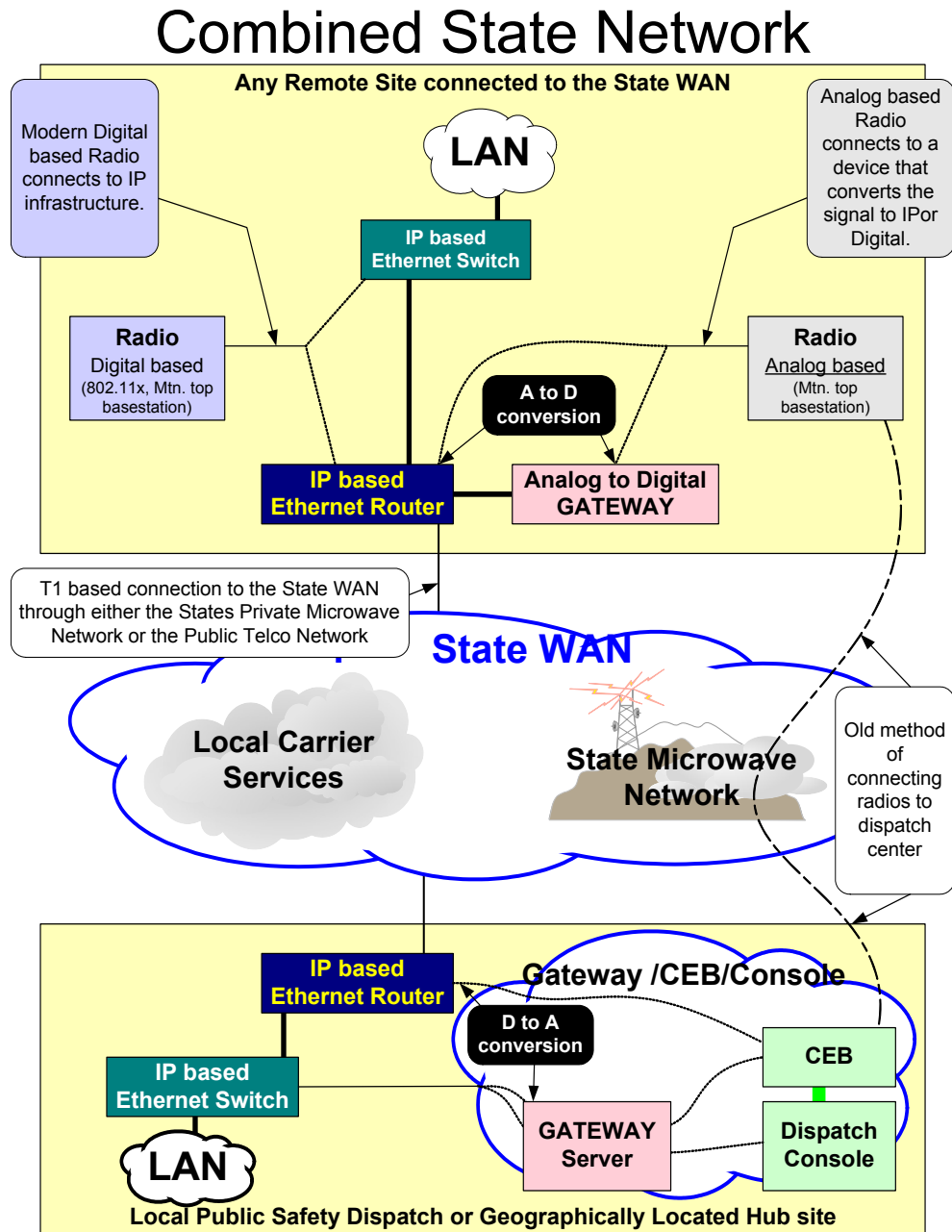*Figure 8:* Combined Network Resources

The combined network provides a broad transport mechanism for application delivery on a statewide basis. Applications running in this environment will have to be tested at the lowest bandwidth levels on the network to ensure usability at all potential endpoints. Even with a bandwidth limitation, an effective application layer can be implemented that delivers important

content to network participants. Among the more important applications that can and are being made available on a statewide basis are the Utah Criminal Justice Information System (UCJIS), Regional Information Sharing System (RISS), Mobile Data Collection System (MDCS), and the Department of Corrections Offender Tracking database (OTRACK). Many more applications are possible that can work efficiently in this environment and provide significant benefit to the rural areas of Utah.

Figure 9 illustrates the projected coverage area of the combined interoperable network for voice and leveraging of all available voice resources:
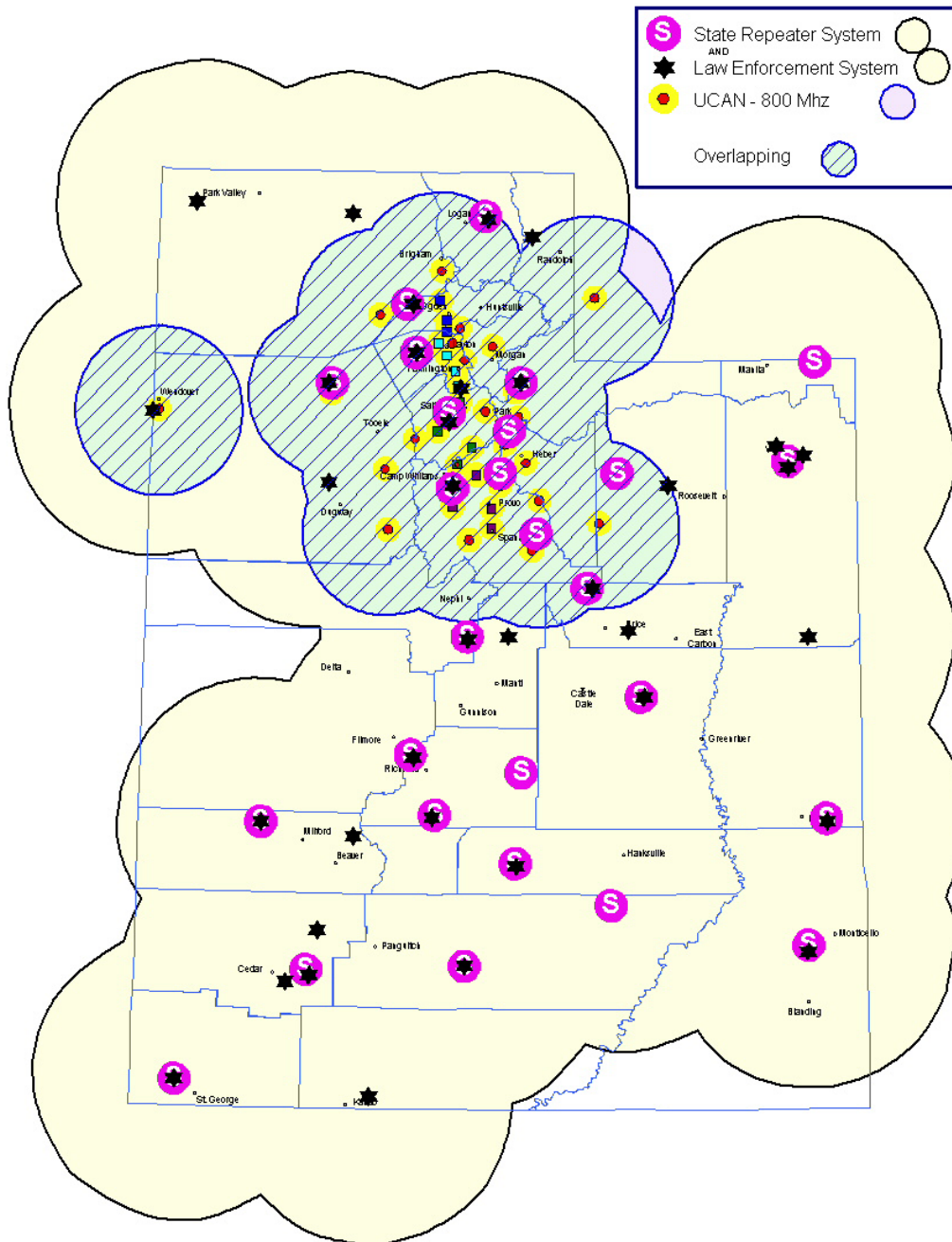

Figure 9: UWIN Wireless Voice Coverage for the Combined Network

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Technology Baseline: The basic technologies needed to implement the overall plan are largely available within the state, with the exception of a number of additional switches, routers, and analog to digital converters. Pilot projects to test mobile data technology in rural areas are already in process.

- 800 MHz Voice Radio
- 150 MHz Repeater Networks
- 802.11 Wireless Hotspots
- 450 MHz and 700 MHz Mobile Data Solutions
- State of Utah Wide Area IP Network (including microwave backbone)
- Radio Control over IP
- Analog to Digital (A-D) and (D-A) Digital to Analog Converters
- Communication Gateway Servers
- Utah Master Directory (UMD)

Capability Assessment: Technical and planning staff from ITS, UCAN, UEN, and DPS have the requisite technical experience and skill resources to design and implement the plan if funding is available.

Dependencies/Interdependencies: The plan assumes a high level of planning, coordination, and resource sharing from the principal participating agencies. Customer use of UWIN is also a critical dependency and is itself dependent upon delivering high service value.

Product Dependencies and/or Requirements: Defined service products will be needed for the overall combined service offering and for clients requiring only subsets of the overall UWIN service product. A tiered structure of products with rates is anticipated that will be at or below market for any comparable private services.

Among the possible product requirements may be product offerings such as:

- 800 MHz Voice Services
- 700 MHz Voice and Data Services
- 450 MHz Voice Services
- 150 MHz Voice Services
- Mobile Data Services (Low Speed 33 kbps)
- Mobile Data Services (High Speed 100 kbps)

Financial Impact Assessment:
The State has received $5.7 million in federal funding from Homeland Security and Bio-Terrorism grants to purchase the equipment needed to implement a statewide voice-data communications system. Funding for additional ongoing operating costs has been identified as follows:

- Projected Ongoing Costs
  - UWIN Circuit and Maintenance Costs $ 510,210
  - Mobile Data Network Maintenance Costs $ 228,735
  - Omni-Link Maintenance Costs $ 500,000
    Total Projected Costs $1,238,945

- Projectable Billable Revenues
  - State Repeater System Rate Increase $ 124,900
  - Mobile Data Network Billing $ 228,735
    Total Projected Billable Revenue $ 353,635

    Projected Appropriation Needed $ 885,310

In addition to the projected billable revenues users of the system have invested funds to purchase equipment needed to utilize the system.

- Capital investment funding to retire the UCAN capital equipment bonds so the system can be cost effective for all participants:
  - Based upon information from UCAN, this would require $10,000,000.

Detailed Costs need to be more focused around "products." These products, though part of the larger equation, must each be able to be inserted and removed from the equation without disrupting the other products. Each product and its associated phases will have costs identified:

- o INFRASTRUCTURE
  - Phase 1: Install Routers at Radio ites
  - Phase 2: TBD
- o MOBILE DATA
  - 802.11
    - Phase 1: Test Phase (still in progress)
    - Phase 2: DPS "Hot Spots"
    - Phase 3: State Building Wireless LANS
  - IPMobileNet
    - Phase 1: Test Phase: Logan and Tooele (Completed)
    - Phase 2: Park City Pilot Project (Completed)
    - Phase 3: 48 Sites, 700MHz initial rollout (Uinta Basin, Southwest Utah)
    - Phase 4: Statewide 700 MHz rollout (Salt Lake Valley in Progress)
- o VOICE (RADIO)
  - Phase 1a: Replace Remaining Master IIs with Narrowband Capable Stations.
  - Phase 1b: Install UCAN Olympic legacy conventional repeaters next to existing VHF stations in key locations around the state.
  - Phase 2: Migrate VHF to narrowband.
- o INTEROPERABILITY
  - Phase 1: Cross-connect 800 and VHF stations at key communications sites.
  - Phase 2: Connect 800 and VHF to routers and WAN.
  - Phase 3: Statewide interconnect management system.

The emphasis within this preliminary analysis is on costs. Executive management and the Legislature will handle funding sources and methods.

Gap Analysis: The principal gaps associated with this project include:

- Feasibility testing for analog to digital converters and gateway technologies.
- Development of a governance structure that is acceptable to stakeholders.
- Encouraging and obtaining active agency participation.
- Final requirements definition approved by all stakeholders.
- Integration and coordination of planning and implementation resources from participating agencies.
- Development of an implementation plan that is approved by stakeholders.
- Development of an overall UWIN security plan.
- Development of a customer communication plan.
- Practical methods for sharing technical staff to avoid duplication of efforts.
- Funding authorization for all phases of the project.

- Interference between public safety 800 MHz spectrum and AT&T and Nextel commercial 800 MHz spectrum which may cause problems with designing the network solution. There is a possibility that this problem will be propagated into the network solution if not addressed.

Plan Implementation: Early success with interoperability in the wireless voice arena will likely be achieved using new Internet Protocol or IP based devices to provide a common platform for interconnecting existing disparate radio networks. This technology is based on the concept that different networks can be interconnected using a device which translates the language of one network to a common language first, and then converts from this common language to the foreign language used by the other network. This device is known in network terms as a protocol gateway. (See Figure 10.)
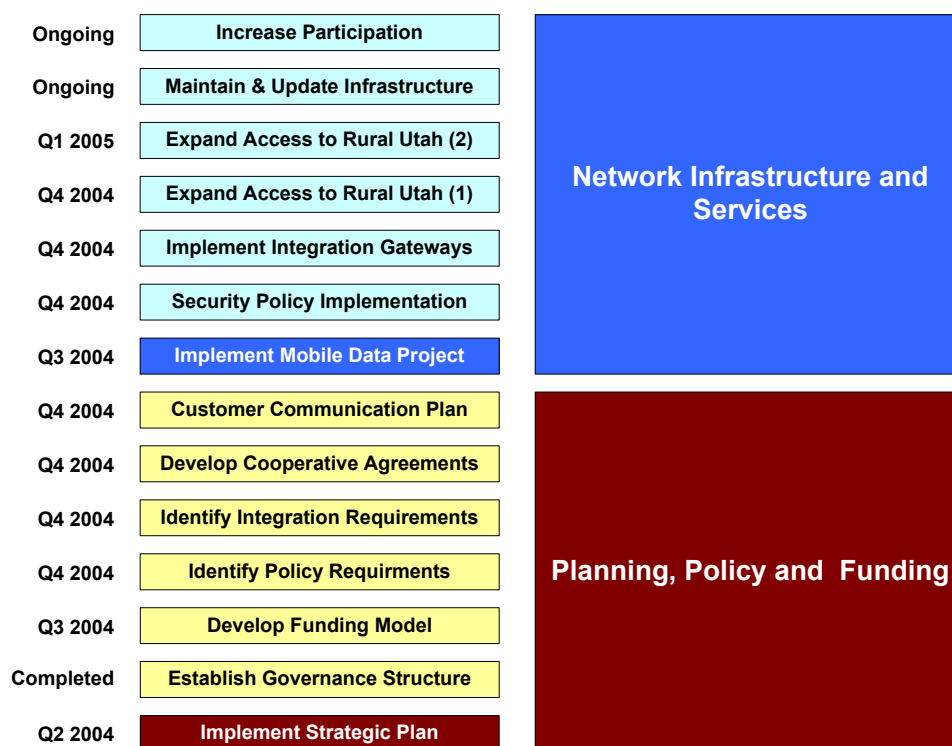
Ongoing	Increase Participation	**Network Infrastructure and Services**
Ongoing	Maintain & Update Infrastructure	
Q1 2005	Expand Access to Rural Utah (2)	
Q4 2004	Expand Access to Rural Utah (1)	
Q4 2004	Implement Integration Gateways	
Q4 2004	Security Policy Implementation	
Q3 2004	Implement Mobile Data Project	
Q4 2004	Customer Communication Plan	**Planning, Policy and Funding**
Q4 2004	Develop Cooperative Agreements	
Q4 2004	Identify Integration Requirements	
Q4 2004	Identify Policy Requirments	
Q3 2004	Develop Funding Model	
Completed	Establish Governance Structure	
Q2 2004	Implement Strategic Plan	

Figure 10: General Implementation Timeline

By using IP technology, voice or data communications can be translated to the common language of the Internet and Utah's Wide Area Network. Once the language is IP, it can be sent anywhere it needs to go. If the destination of the communication is a different network, with a different language, the IP message will be sent to the gateway between that network and the State WAN. As the communication passes from the WAN through the gateway, the communication will be translated into the native language of that system.

After a complete assessment of all existing Utah governmental voice and data systems has been completed, a team will develop a short-term plan to integrate these existing systems utilizing the gateway concept. VHF, UHF, 800 MHz., voice only, data only, and other systems will be designed to pass communications between each other using the common gateway infrastructure described above. To create such a system, the State will rely heavily on the existing statewide microwave network, the statewide Wide Area Network, IP protocol and gateway devices, as well as the use of existing State owned radio communications sites. Federal and surrounding state networks will be included as much as possible in this first phase of integration.

Emerging new technologies will be assessed, placed in field trials, and evaluated for deployment. The IP Mobile Net system, currently in field trial, will be studied for deployment statewide. Commercial options will be assessed for use in those areas of the state where they are available. New systems, which are being promised by vendors such as Motorola, IPMobileNet, M/A Comm and others, will be evaluated.

Several possible future networks will be modeled, the costs evaluated, and analyzed in terms of their ability to provide mobile voice and data services using an integrated statewide network approach. The benefits and deficiencies of each option will be studied. The needs of the various organizations with a vested interest in the system will be key to making these comparisons. Based upon this analysis, a long-term statewide mobile communications infrastructure plan, with a phased implementation schedule, will be developed. The goal of this long-term plan will be to provide a tactical roadmap for the development of a new, interoperable, multi-agency, mobile voice and data communications system.

Implementation of the short and the long-term plans will provide the framework to smoothly evolve from today's existing disparate and non-interoperable mobile voice and data networks, to a future statewide-integrated communications system. New technologies being reviewed and tested include:

- Vehicle Area Networks: The 700 MHz vehicle radio will be extended to interface with handheld devices to support voice and data applications.

- Flexible incident command mesh networks.

- Software defined radio.

Management Strategy: The overall management and oversight strategy for UWIN hinges upon service provider involvement with key management areas. Fundamental to this management and governance structure are the following principles:

- UWIN must be a flexible organization that maintains the necessary relationships to facilitate a two-way flow of information between the program and the public safety community, industry, and key political allies.

- UWIN must leverage the strengths and capabilities of State service providers such as ITS, UCAN, Public Safety and other key stakeholders and work together as a cooperative service network with well-established roles and responsibilities.

- The UWIN management and governance structure will speak, act, and organize as one voice for the combined UWIN network and its related services.

- Establish a concerted effort to understand, influence, and accommodate external factors that affect the program by developing an awareness of their impact and by making adjustments to the UWIN plan that are responsive to customer requirements.

- UWIN will foster relationships and form formal advisory groups among various State, Federal, and local agencies to reduce redundancy and facilitate collaboration.

The UWIN management and governance organization is a "virtual" agency that integrates leadership from key agencies, includes participation from State and local public safety officials, as well as Federal partners. The program informs public safety stakeholders about issues relating to interoperability and also leverages community expertise to enhance fulfillment of the UWIN mission. Resources are configured to best address shifting needs. The direction of the program is

determined and maintained through a planning and communication process that incorporates input from users, managers, and executives at all levels of government.
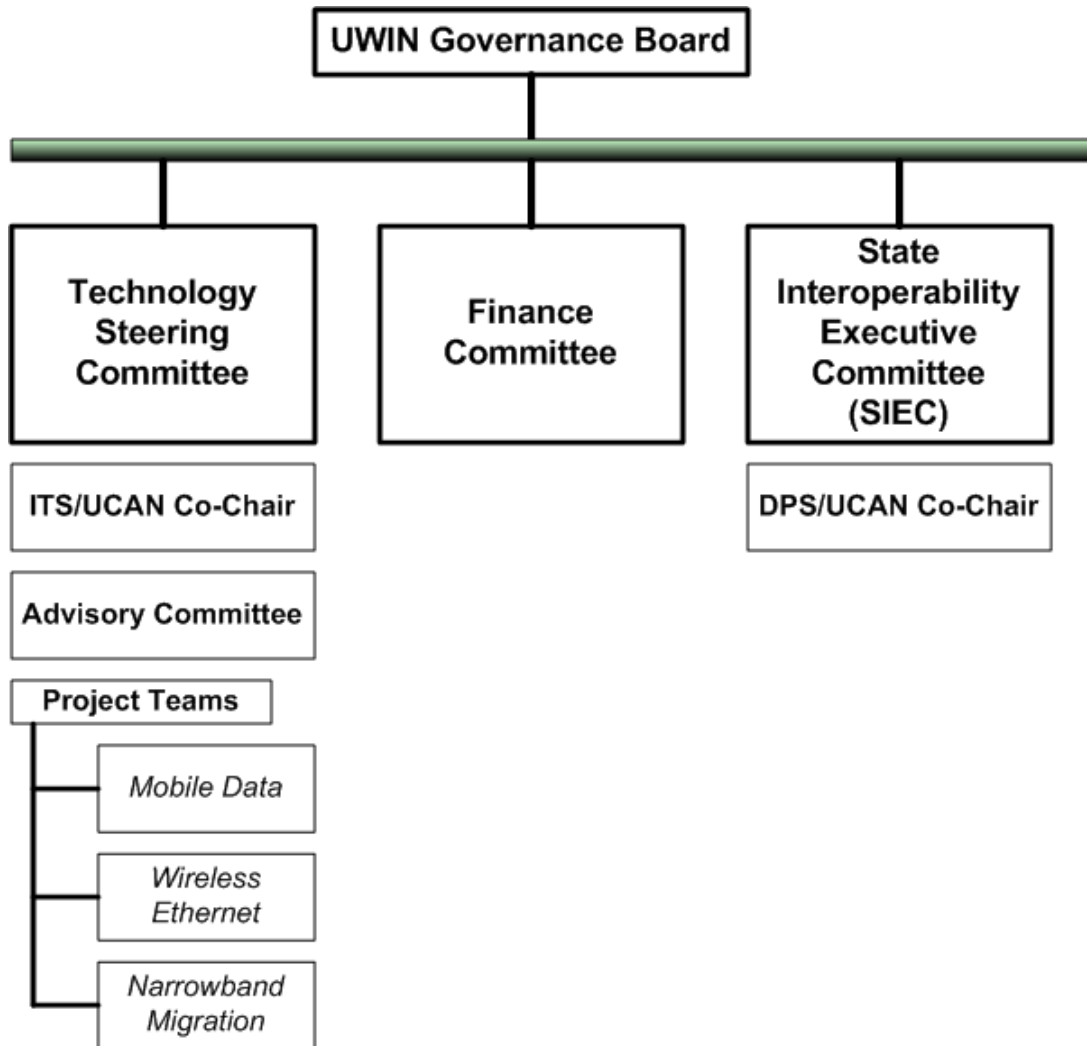

Figure 11: UWIN Functional Management Organization

As detailed in the Executive Order that created UWIN, management is composed of a full spectrum of public safety agency representatives, including Federal, State, and local government.

UWIN Evaluation: A balanced scorecard approach will be used for measuring overall UWIN performance and to ensure that the UWIN plan remains on track. The following perspectives will be used:

- A set of customer perspective measures that examine the level of quality and the types of products, services, and relationships required today.

- A set of internal perspective measures that examine the program's use of resources and its commitment to quality.

- A set of financial perspective measures that monitor the program's operating expenses while focusing on improved financial performance.

- A set of innovation and learning perspective measures that are forward-thinking and monitor what is required to remain successful and responsive to customer needs in the future.

Best practices require that strategic goals and objectives be linked to annual performance goals and to the day-to-day activities of managers and staff. UWIN will use outcome measures at the strategic level for assessing overall program effectiveness, and output measures at the tactical level for measuring progress toward completing annual performance goals. Strategic objectives will be translated into a set of performance indicators distributed among four perspectives: customer, innovation and learning, financial, and internal processes.

Fostering the implementation of interoperability by encouraging near-term improvements will require UWIN to sustain credibility within the agency wireless user community. This credibility will be maintained through quality products and services that are of real value to the community.

Using the set of customer perspective measures, UWIN will seek to obtain the views of agencies on whether UWIN is doing the right things and doing those things right.

The innovation and learning perspective is forward thinking and forward looking and helps to assess UWIN's ability to sustain credibility into the future. The critical components of this measurement are to strive for continuous product and service improvement, to maintain an informed and empowered workforce, and to remain proactive regarding changing agency needs.

The elements of the financial perspective ensure that funds are used efficiently, maximizing benefits to UWIN customers. The financial perspective monitors UWIN's operating expenses while focusing on improved fiscal performance.

The internal perspective is a critical self-assessment by the program to ensure that UWIN is providing quality products and a complete range of services that are needed by our stakeholders. These measures assess the quality of project management processes and the use of resources.

Context (External and Internal Environments): Context includes accepted common values and principles, business drivers and performance objectives, and technology trends. These factors influence the development and direction of IT strategic planning for any specialized area and must be integrated into the strategic planning process as context. External factors specific to interoperability and radio communication identified by PSWN include:

- A flexible program structure that can effectively address the needs of the changing public safety communications environment.

- Recognition that the homeland security environment has changed substantially and that key change events can shift public opinion and political support regarding interoperable public safety communications.

- A thorough understanding of government entities responsible for providing sufficient resources (e.g., spectrum and funding), and for supporting certain technology developments.

- A keen awareness of the efforts of industry to provide technical standards, security enhancements, and affordable equipment for the public safety community.

Values and Guiding Principles: The State IT Strategic Planning Process has identified the following values to shape IT strategic plans, and provide guidance in the use of information technology in the State:

- The Governor, the State, and its citizens embrace the use of information technology to improve the quality of life for all citizens.

- State government must provide reasonable access to all information which is not classified, and provide processes for individuals and agencies to verify information and correct errors if necessary.

- IT initiatives must remain customer focused and deliver useful, accurate, and timely information and services to those who need it.

- IT decisions must be cost effective, and should be evaluated based on cost-benefit analysis, consistent criteria for evaluation, adequate consideration of alternatives, and an identification of needs.

- IT infrastructure must promote universal access to government information and services through reduction of social, economic, and ability barriers, recognizing that citizen awareness and education is crucial to all universal access efforts.

- IT must be viewed as a strategic asset, and should play a key role in re-engineering government processes to increase efficiency and effectiveness.

- Information technology resources must help to multiply knowledge, streamline service, facilitate communications, and provide management information to all knowledge workers throughout the organization.

- State government encourages innovation in the application of information technology.

- Information must be adequately secure and protected to ensure its confidentiality, integrity, and availability, and to prevent, detect, and minimize loss from intentional or accidental hazards.

Principals for eGovernment in Utah: The Governor's Working Group on eGovernment adopted the following principals as guides to developing eGovernment services for the State of Utah. Many of these principles impact the development of statewide communication and wireless infrastructure. In this document, customers include citizens, businesses, employees, and other government entities.

- **Frictionless:** Design and implement services that fully, quickly, and conveniently satisfy the customer's expectations and needs.

- **Efficient:** Design and implement services to streamline the customer's encounter with the government while minimizing cost and waste for both.

- **Cost Effective:** Design and implement services that use shared resources while delivering quality products at a reasonable cost.

- **Single View of Customer:** Design and implement services so that the customer is recognized uniquely whether single or multiple communication channels are used to obtain the service. The customer should not be able to tell whether single or multiple records are used to support the transaction.

- **Customer Focused Service:** Design and implement services with customer needs and requirements at their center. Services should be built from the customer's perspective, taking into account a holistic view of government services and requirements.

- **Accountability through Success Metrics**: Design and implement services with a clear understanding of what success is and how it can be measured. Services are constantly evaluated to assess whether or not they are meeting these goals.

- **Business Needs Drive Process:** Business line owners must drive service design because they are the most familiar with both the needs of the customer and the requirements of the business.

Business Drivers and Performance Objectives: Also important to the strategic planning process are the business goals and performance objectives that have been continually emphasized by the Governor:

1. IT must support the business and program priorities of State government. The Governor has established six performance goals for the State:

   - Providing world-class education.
   - Creating quality jobs and a quality business environment.
   - Improving government services.
   - Enhancing the quality of life for all Utahns.
   - Fostering self-reliance.
   - Protecting Utah's foundation of community values.

   The Governor has also added long-range goals for the state:

   - Slow the investment in bricks and mortar.
   - Refuel the settlement of rural Utah.
   - Use what we have better.
   - Increase individual responsibility and community values.
   - Become a generation of planners.
   - Make quality our comparative advantage.

2. Utah residents will be able to access most State services online, 24 hours a day, seven days a week.

3. We will implement systems that are integrated across the State enterprise, and in time will be integrated with local governments, other states, and key Federal agencies.

4. Our new vision will provide improved customer service and taxpayer savings.

5. The Division of Information Technology Services (ITS) is responsible for implementing and delivering enterprise IT services.

6. ITS is charged with providing basic IT services to agencies effectively and efficiently to assist them in achieving their mission.

Technology Trends: The State is directly impacted by expectations of employees and citizens as customers that are experiencing expanding uses of information technology. Some of the most important high impact technology trends include:

- **Ubiquitous Web Presence:** Technology is increasingly providing access from almost anywhere to the Internet, creating a virtual conduit for the individual to connect to a wide range of information as well as to participate indifferent user communities. Additionally, users expect access to high-quality, just-in-time information from expert sources.

- **Rapid Connectivity:** High-speed networks, remote access, and wireless increasingly provide nearly seamless access.

- **Increasing Freedom with Mobile Devices:** Users are choosing portable, small, and wireless devices for their computing needs, which helps them realize mobility in information and network access. Additionally, these devices provide more capacity and functionality in a single device.

- **24/7 Service Expectations:** Individuals anticipate service and support assistance to be 24 hours a day, seven days a week.

- **Electronic Commerce:** Consumers expect the convenience of numerous products and services to be available via secure online purchase and transaction systems.

- **Sophisticated Applications:** Customers are expecting easier to use applications with mature and sophisticated functionality.

Definitions:

802.11x: A family of IEEE standards for wireless LANs.802.11b defines an 11 Mbps data rate in the 2.4GHz band.

Access Control: The management of permissions for logging onto a computer or network.

Analog/Digital Converter: A device that converts continuously varying analog signals from instruments that monitor such conditions as movement, temperature, sound, et cetera, into binary code for the computer.

Authentication: The process of establishing a match between an entity and its identifier.

Authorization: Authorization controls what services an identifier can access or use.

Base Station: An earth-based transmitting and receiving station for two-way radio, cellular phones, paging services, and other wireless transmission systems.

CDPD (Cellular Digital Packet Data): A digital wireless transmission system that is deployed as an enhancement to the existing analog cellular network. It provides a packet overlay onto the AMPS network and moves data at 19.2 Kbps over ever-changing unused intervals in the voice channels. CDPD is used for applications such as public safety, point of sale, mobile positioning, and other business services.

Digital/Analog Converter: A device that converts digital pulses into analog signals.

Encryption: The conversion of data into a secret code for transmission over a public network. The original text, or "plaintext," is converted into a coded equivalent called "cipher text" via an encryption algorithm. The cipher text is decoded (decrypted) at the receiving end and turned back into plaintext.

Directory: A database repository of users, hardware devices, and applications in a network often referred to as a tree.

Microwave: An electromagnetic wave that vibrates at 1GHz and above. Numerous transmission systems use microwaves including line-of-sight between buildings and across vast distances, communications satellites, PCS cellular systems, and wireless LANs.

Repeater: A communications device that amplifies or regenerates a radio frequency signal in order to extend the transmission distance. Available for both analog and digital signals, it is used extensively in long distance transmission.

Router: A device that forwards data packets from one local area network (LAN) or wide area network (WAN) to another.

Switch: A mechanical or electronic device that directs the flow of electrical or optical signals from one side to the other. Switches with multiple ports, such as a WAN/LAN switch, are able to route traffic.

Trunk: A communications channel between two points. Trunk typically refers to large-bandwidth telephone channels between switching centers that handle many simultaneous voice and data signals, but is also used in wireless voice communications transmissions.

References:

Plan Team Members: Camille Anthony, Phil Bates, Doug Chandler, Dave Fletcher, Jake Hunt**,** Norm Johnson, David Lee, Steve Proctor, Floyd Ritter, John Stucki, Boyd Webb, Gary Whatcott, Verdi White, and Robert Woolley

Related Documents:
CAPWIN Capital Wireless Integrated Network:: Project and Solution Overview. International Business Machines, August 2002.
Federal Communication Commission: Strategic Plan, FY2003-FY2008, Washington D.C.: Federal Communications Commission, 2002
Leavitt, Michael O., *Letter to Agencies and IT Employees regarding State IT Organization*, Salt Lake City: Office of the Governor, August 2, 2002.
_____., *State of the State Messages*, 1993-2002. Salt Lake City: Office of the Governor.
Public Safety Communication Security Awareness Guide. Washington D.C: Department of Justice and Department of the Treasury, (1999?).
Public Safety Wireless Network: Strategic Plan, Washington D.C: Department of Justice and Department of the Treasury, January 2000.
Road to the Future, a presentation to the Information Technology Commission by the Chief Information Officer, Salt Lake City: Office of the Governor, November 2002.
Utah's Strategic Information Technology Plan: "Making IT Happen," Salt Lake City: Office of the Governor, May 2000
Utah Technical Architecture Definition, Salt Lake City: Office of the Governor, January 2000.

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